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Hence we have

$$\sin s \sin p = \{\cos \mathrm{D}.\Delta\xi - \sin \mathrm{D}(\eta\Delta\xi - \xi\Delta\eta)\}/\mathrm{LN}_1$$

$$\sin s \cos p = [-\sin \mathrm{D}(\xi\Delta\xi + \eta\Delta\eta) + \cos \mathrm{D}\{\Delta\eta - \xi(\eta\Delta\xi - \xi\Delta\eta)\}]/\mathrm{LNN}_1$$

which, when (3) is remembered, are easily seen to be equivalent to (7) and (8).

University Observatory, Oxford:
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Analysis of the Colours and Magnitudes of 3630 *Stars between the N. Pole and* 25° *S. Declination.* By W. S. Franks.

During the recent investigation on star colours and spectra (*Monthly Notices*, lxviii. 672), it occurred to me that an analysis of the colours and magnitudes might form a fitting sequel, and might possibly furnish some additional information. I therefore tabulated each hour of R.A. separately into 6 magnitude groups and 7 colour groups (as before); the magnitudes were all based on the *Revised Harvard Photometry*, and the minimum limit was taken at 6·5 of that scale. Of course this list does not contain *all* the 6·5 magnitudes to be found in the *R.H.P.*, but only those observed. The *comites* of double stars were carefully excluded. It is unnecessary waste of space to give the extended details here; suffice it to say that they were all ultimately arranged in four divisions—two galactic (hours III to VIII, and XV to XX); and two non-galactic (hours XXI to II, and IX to XIV). These were again combined into two—galactic and non-galactic—as here shown:—

A. *Combined galactic regions.*

Magnitude.	White.	Yellowish-White.	Pale Yellow.	Yellow.	Pale Orange.	Orange.	Orange-Red.	Total.
>1·5	4	3	1	1	...	1	1	11
1·6–2·5	14	1	1	1	...	...	...	17
2·6–3·5	24	9	15	19	...	2	...	69
3·6–4·5	90	42	45	42	9	4	...	232
4·6–5·5	268	166	139	84	48	27	1	733
5·6–6·5	292	168	208	82	82	51	10	893
Total	692	389	409	229	139	85	12	1955

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B. *Combined non-galactic regions.*

Magnitude.	White.	Yellowish White.	Pale Yellow.	Yellow.	Pale Orange.	Orange.	Orange-Red.	Total.
> 1·5	2	...	1	1	...	...	...	4
1·6–2·5	8	1	2	9	...	1	...	21
2·6–3·5	10	10	8	11	2	3	...	44
3·6–4·5	43	32	39	31	5	6	1	157
4·6–5·5	159	107	126	72	44	29	5	542
5·6–6·5	221	164	231	115	97	73	6	907
Total	443	314	407	239	148	112	12	1675

C. *The whole together.*

Magnitude.	White.	Yellowish White.	Pale Yellow.	Yellow.	Pale Orange.	Orange.	Orange-Red.	Total.
> 1·5	6	3	2	2	...	1	1	15
1·6–2·5	22	2	3	10	...	1	...	38
2·6–3·5	34	19	23	30	2	5	...	113
3·6–4·5	133	74	84	73	14	10	1	389
4·6–5·5	427	273	265	156	92	56	6	1275
5·6–6·5	513	332	439	197	179	124	16	1800
Total	1135	703	816	468	287	197	24	3630

It will be at once seen that the relative distribution of colours is not the same in A as B; but that there is a great excess of white stars in the galaxy regions, and a decided preponderance of coloured stars in the non-galactic regions. This is better shown by the corresponding percentages:—

	A.	B.	C.
White	35·4	26·4	31·2
Yellowish-white . . .	19·9	18·8	19·4
Pale yellow	20·9	24·3	22·5
Yellow	11·7	14·2	12·9
Pale orange	7·1	8·8	7·9
Orange	4·4	6·7	5·4
Orange-red	0·6	0·8	0·7
	100·0	100·0	100·0

There is thus an undoubted physical connection between the colour of the stars and the galaxy; and, in the light of spectroscopic evidence, it looks as if the galaxy was the newest and most vigorous part of the stellar universe, since nearly all the active sidereal phenomena are only to be found in that region. When we consider its association with Helium stars, "Wolf-Rayet" stars, bright-line spectra, short-period variables, *novæ*, etc., we are driven to the conclusion that here is the storehouse of energy for the sidereal universe, and such enormous potentiality cannot belong to any but the youngest and most active stage of existence.

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Note on Spectral Class and Stellar Colours. By Julia Bell, M.A.

(*Communicated by Professor Karl Pearson, F.R.S.*)

In the *Monthly Notices*, vol. lxvii. pp. 539–42, Mr. W. S. Franks published what is statistically termed a contingency table, showing the dependence of colour on spectral class for 928 northern stars from $-25°$ to N. Pole. The statistical reduction of this table was made by Dr. Alice Lee, and published in a paper on the "Correlation of Stellar Characters," *Monthly Notices*, lxviii. p. 422, by Miss W. Gibson and Professor K. Pearson. The coefficient of mean square contingency was found to be $C_1 = {\cdot}74$, thus showing a very considerable measure of relationship between stellar colour and spectral class.

In the last issued *M.N.* (vol. lxviii. p. 673) Mr. Franks provides a further contingency table for northern stars between the same limits of declination, but including nearly four times as many stars, namely 3497. He rightly insists on the close association of the two characters, spectral class and colour class. It will not, I think, be without interest to consider what is the exact numerical measure of this relationship, and whether it is in keeping with the earlier value, as found from a much smaller sample.

Contingency Table for Northern Stars, $-25°$ to N.P.

Colour Class.

Spectral type.	White.	Yellowish-White.	Pale Yellow.	Yellow.	Pale Orange.	Orange.	Orange-Red.	Total.
Bright line Spectra	0 (- ·62)	0 (- ·42)	2 (+ 1·55)	0 (- ·24)	0 (- ·15)	0 (- ·11)	0 (- ·01)	2
Intermediate	5 (+ 1·90)	4 (+ 1·92)	1 (- 1·24)	0 (- 1·18)	0 (- ·78)	0 (- ·56)	0 (- ·07)	10
Orion Type	191 (+116·06)	50 (- ·45)	1 (- 53·11)	0 (- 28·58)	0 (- 18·75)	0 (- 13·49)	0 (- 1·66)	242
Sirius Type	793 (+424·4)	338 (+ 89·93)	59 (-207·11)	0 (-140·54)	0 (- 92·22)	0 (- 66·36)	0 (- 8·17)	1190
α Carinæ Type	78 (+ 56·41)	204 (+113·52)	143 (+ 45·95)	9 (- 42·26)	0 (- 33·63)	0 (- 24·20)	0 (- 2·98)	434
Procyon Type	7 (- 27·37)	47 (+ 23·86)	51 (+ 26·18)	4 (- 9·11)	2 (- 6·60)	0 (- 6·19)	0 (- ·76)	111
Capella Type	9 (-128·51)	69 (- 23·56)	242 (+142·71)	68 (+ 15·56)	41 (+ 6·59)	13 (- 11·76)	2 (- 1·05)	444
Arcturus Type	0 (-245·90)	17 (-148·52)	260 (+ 82·45)	274 (+180·23)	155 (+ 93·47)	84 (+ 39·73)	4 (- 1·45)	794
Aldebaran Type	0 (- 33·76)	0 (- 22·72)	12 (- 12·37)	32 (+ 19·13)	29 (+ 20·55)	36 (+ 29·92)	0 (- ·75)	109
Betelgeuse Type	0 (- 46·45)	0 (- 31·27)	11 (- 22·54)	26 (+ 8·29)	44 (+ 32·38)	59 (+ 50·64)	10 (+ 8·97)	150
19 Piscium Type	0 (- 3·41)	0 (- 2·30)	0 (- 2·46)	0 (- 1·30)	0 (- ·85)	3 (+ 2·39)	8 (+ 7·92)	11
Total	1083	729	782	413	271	195	24	3497